MBD in Peritoneal Dialysis

Dr. Osama El-Shahat

Consultant Nephrologist

Head of Nephrology Department

New Mansoura General Hospital (international)

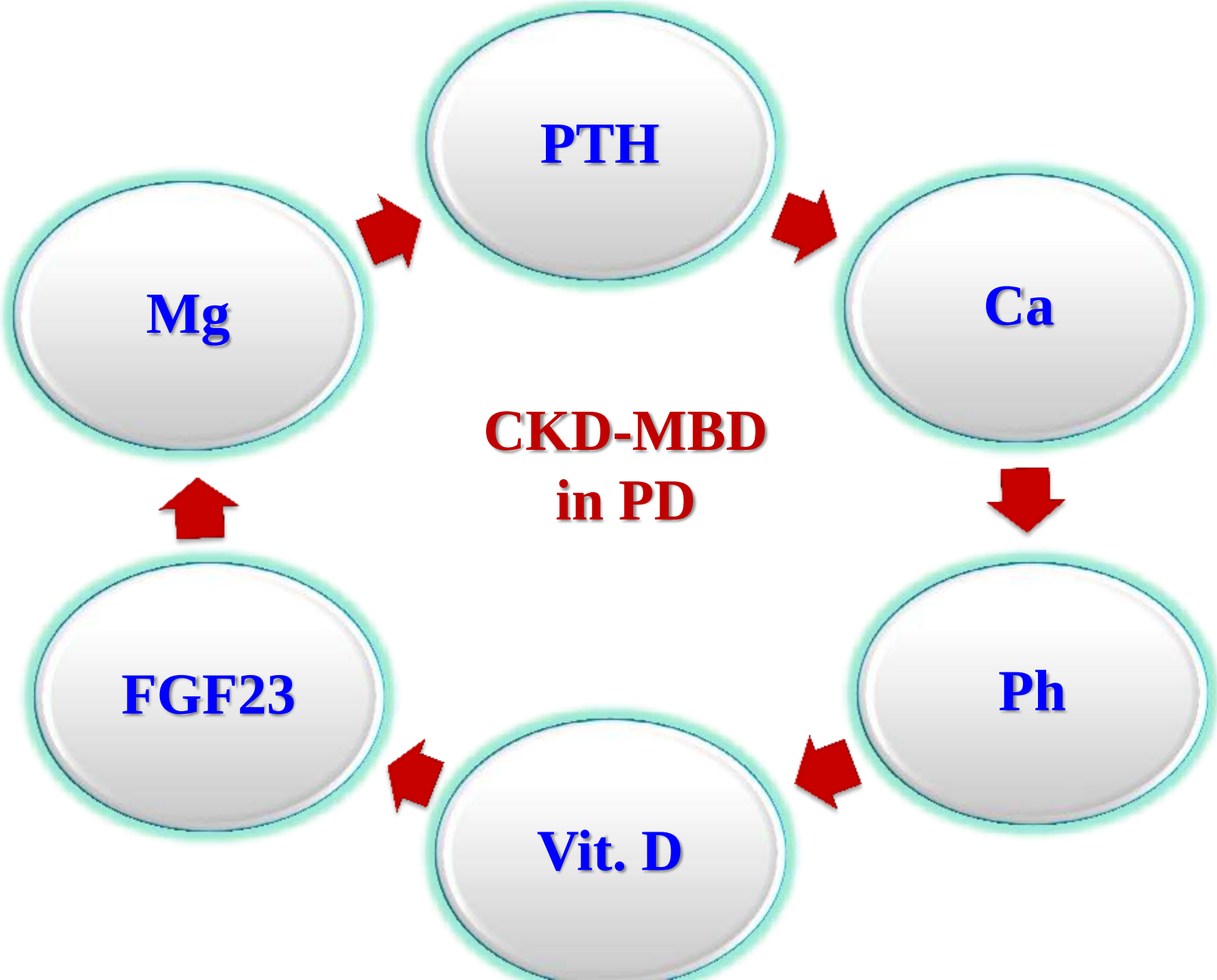
(Egypt)

NMGH

DNG
Dakahlia Nephrology Group
رابطة أطباء الكلى بالدقهلية

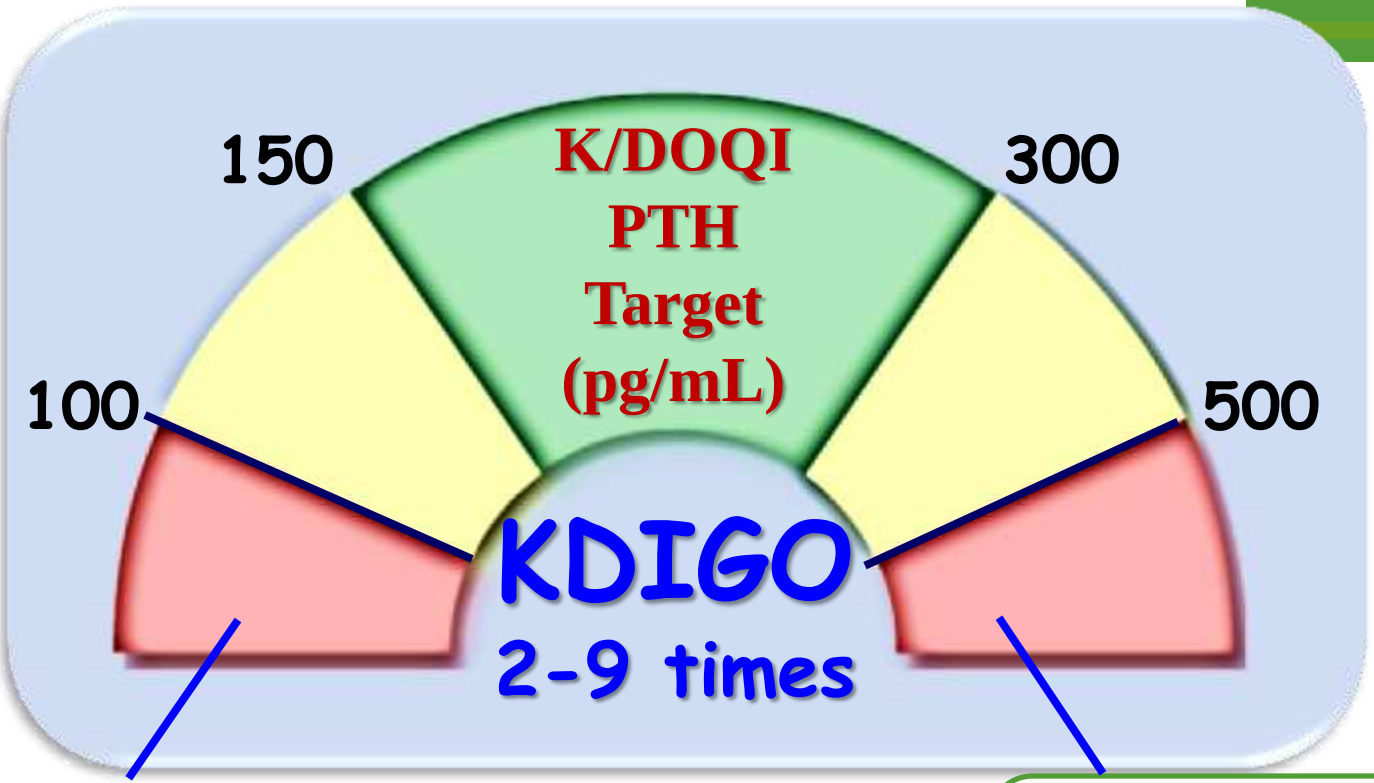
Agenda

- ***Difference between PD and HD in MBD***
  - *Causes*
  - *Medical treatment*
  - *Surgical treatment*
- ***Summary***


PTH
Ca
Ph
Vit. D
FGF23
Mg
CKD-MBD
in PD

MBD-CKD in PD

Proposed KDIGO Guidelines: Target Range for PTH



– Low bone turnover

– Adynamic bone disease

– High bone turnover
– Bone pain
– Cardiovascular disease
– Cognitive impairment

originals
http://www.revistanefrologia.com

A lower proportion of circulating active parathyroid hormone in peritoneal dialysis does not allow the PTH inter-method adjustment proposed for haemodialysis

M. Luisa González-Casaus[1], Emilio González-Parra[2], Carmen Sánchez-González[3], Marta Albalate[4], Concepción de La Piedra-Gordo[5], Elvira Fernández[6], Vicente Torregrosa[7], Mariano Rodríguez[8], Víctor Lorenzo[9]

[1] Unidad de Análisis Clínicos. Hospital Gómez Ulla. Madrid (Spain); [2] Servicio de Nefrología. Fundación Jiménez Díaz. Madrid (Spain); [3] Servicio de Nefrología. Hospital de La Princesa. Madrid (Spain); [4] Servicio de Nefrología. Hospital Infanta Leonor. Madrid (Spain); [5] Unidad de Análisis Clínicos. Fundación Jiménez Díaz. Madrid (Spain); [6] Servicio de Nefrología. Hospital Arnau de Vilanova. Lleida (Spain); [7] Servicio de Nefrología. CDI. Hospital Clínic de Barcelona (Spain); [8] Servicio de Nefrología. Hospital Reina Sofía. Córdoba (Spain); [9] Servicio de Nefrología. Hospital Universitario de Canarias. San Cristóbal de La Laguna, Santa Cruz de Tenerife (Spain)

Nefrologia 2014;34(3):330-40
doi:10.3265/Nefrologia.pre2014.Feb.12384

CONCLUSION

PD patients have a different proportion of circulating forms of PTH from HD patients. For this reason, the formulae used for correcting variations in HD patients are not applicable. In this study,

we suggested other formulas applicable to PD patients.

We believe that it is important to know these differences when considering hyperparathyroidism treatment in these patients, and third generation methods will be very useful in this regard.

CKD-MBD IN PERITONEAL DIALYSIS PATIENTS

- Because PD is a continuous purification technique, serum calcium, phosphorus, and PTH levels are relatively unchanged regardless of the timing of treatment. In this respect, PD differs markedly from hemodialysis, in which their concentrations in the blood change at each treatment.

Ther Apher Dial, Vol. 17, No. 3, 2013

Peritoneal Dialysis International

Chronic Kidney Disease – Mineral Bone Disorder and Peritoneal Dialysis
Peritoneal Dialysis International, Vol. 28 (2008), Supplement 2

0896-8608/08 $3.00 + .00

RENAL OSTEODYSTROPHY IN PERITONEAL DIALYSIS: SPECIAL CONSIDERATIONS

As a result, recent studies have reported a greater prevalence of adynamic forms of renal osteodystrophy, especially in diabetic and peritoneal dialysis patients.
The present article reviews, for patients treated with peritoneal dialysis, the pathophysiologic mechanisms involved in the evolution of this bone disease and the therapeutic modalities for treating and preventing adynamic bone.

Perit Dial Int 2008; 28(S2):S11–S19

Chronic Kidney Disease – Mineral Bone Disorder and Peritoneal Dialysis
Peritoneal Dialysis International, Vol. 28 (2008), Supplement 2

0896-8608/08 $3.00 + .00

RENAL OSTEODYSTROPHY IN PERITONEAL DIALYSIS: SPECIAL CONSIDERATIONS

TABLE 1
Prevalence of Adynamic Bone Disease in Patients Treated with Peritoneal Dialysis

	ABD (%)	OM (%)	MBD (%)	HBD (%)	DM (%)
Rodriguez-Perez *et al.* (38)	42.8	15	11.5	30.7	NA
Sherrard *et al.* (24)	60	6	24.6	9.4	30
Pai *et al.* (33)	46	27	19	8	25
Torres *et al.* (20)	48	10	10	32	21
Sanchez *et al.* (39)	79	NA	NA	21	33

ABD = adynamic bone; OM = osteomalacia; MBD = mixed-bone disease; HBD = hyperparathyroid bone disease; DM = patients with diabetes mellitus; NA = not available.

Perit Dial Int 2008; 28(S2):S11–S19

Chronic Kidney Disease – Mineral Bone Disorder and Peritoneal Dialysis
Peritoneal Dialysis International, Vol. 28 (2008), Supplement 2

0896-8608/08 $3.00 + .00

RENAL OSTEODYSTROPHY IN PERITONEAL DIALYSIS: SPECIAL CONSIDERATIONS

TABLE 2

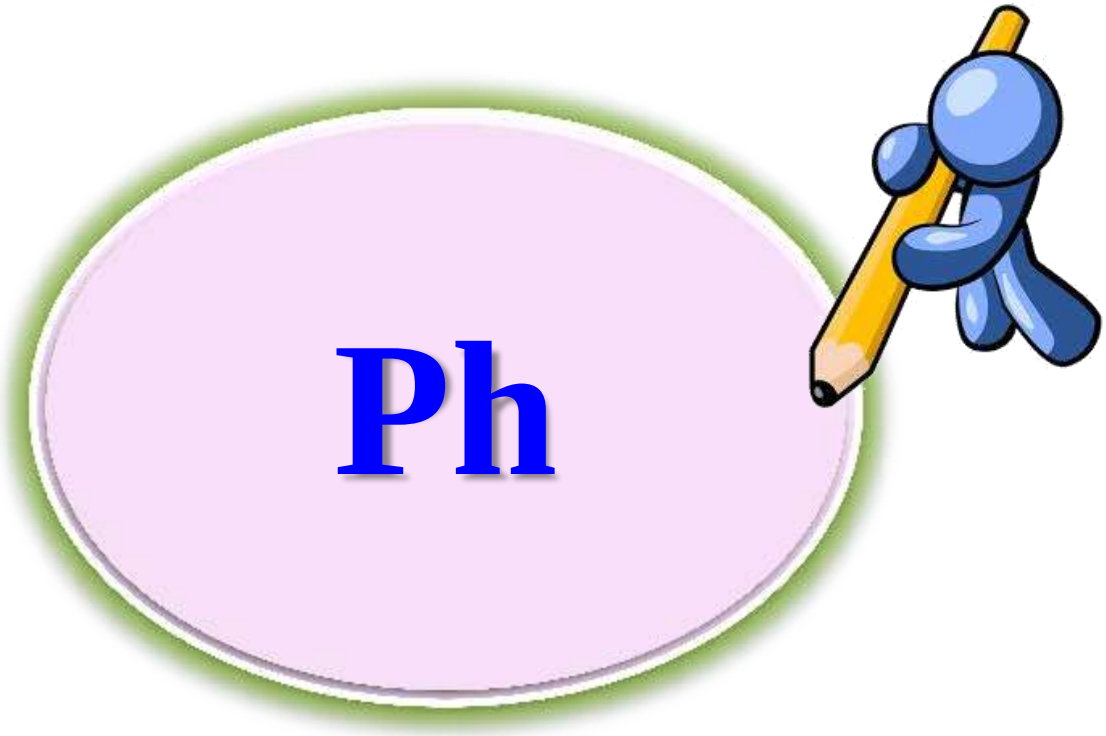
Factors Contributing to the Pathogenesis of Adynamic Bone Disease in Peritoneal Dialysis

Hyperglycemia and insulin deficiency	Inhibition of PTH synthesis (42,43) Increased production of AGEs and impaired osteoblastic matrix synthesis (43) Impaired osteoblastic mineralization (47) Increased osteoblastic apoptosis (44)
Increased AGE and ALE production in dialysate and serum	Increased reactive carbonyl compounds and impaired bone formation (45,46)
High calcium	Inhibition of PTH secretion Impaired osteoclastic activity (12)
High magnesium	Inhibition of PTH secretion (49)
Acidosis	Impaired osteoblastic function (76)
Hypoalbuminemia	Impaired PTH synthesis (51–53,54)
Loss of residual function	Reduced bone mass (50)

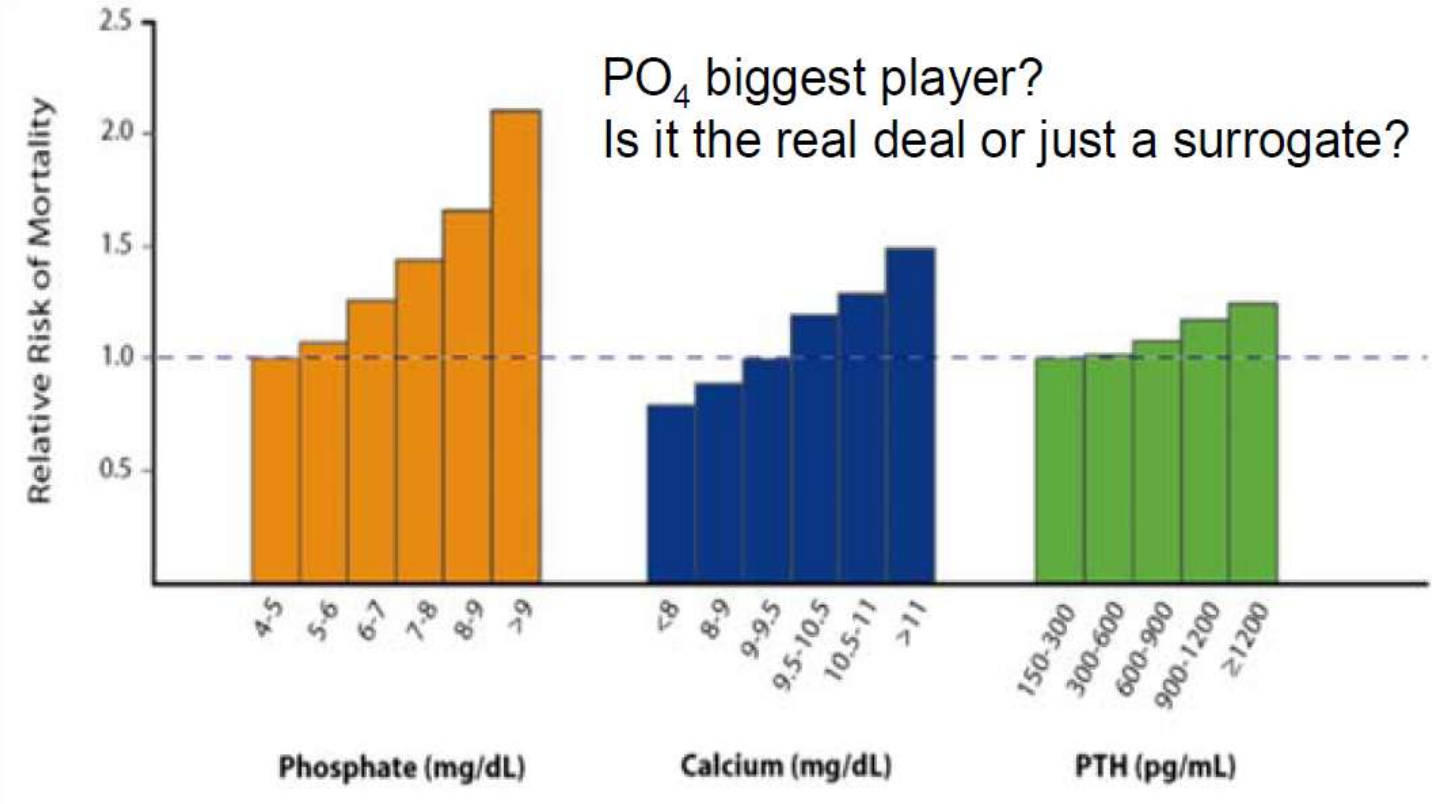
PTH = parathyroid hormone; AGE = advanced glycation end product; ALE = advanced lipid end product.

Perit Dial Int 2008; 28(S2):S11–S19

CKD-MBD in PD



CKD-BMM Biochemical Markers Associated with Greatest Mortality Risk



Multivariable-adjusted relative risk

Adapted from Block GA, et al. JASN 2004

Phosphate Facts

Total Body Phosphate = about 700 g

- 85% in bone and teeth as hydroxyapatite
- 14% intracellular fluids mainly as organic phosphate
- < 1% in extracellular fluid as inorganic phosphate
  - This is component easiest to get at with dialysis

Main source of Phosphorous:

- Dietary
- Bone efflux (Increased PTH)

Phosphate removal

- Renal
- Dialysis
- Saliva and GI (prevent absorption with binders)

Badve PDI 28:S2, 2008 *Hsu, AJKD Dis 1997* *Weisinger Lancet 352:391-, 1998*

Phosphate Facts

Removal by dialysis

Phosphorous Statistics:

- Molecular weight - 96 Daltons
- Radius - 2.8 Angstroms
  - (urea 1.8A; Creat 3.0A)
- Hydrophobic (surrounded by water)
  - Radius functionally larger than 2.8A
- Slow to move from ICF to ECF
  - Unlike urea which readily does move
  - Remember most PO4 in bone, teeth or ICF
- About 50% of circulating PO4 is a Na, Ca or Mag salt
- Negatively charged
  - Not freely diffusible across all membranes
  - Living membrane vs. synthetic membrane

Kuhlman Blood Purif 2010; 29:137-144

Po_4 removal by dialysis

Bottom line:

- Acts more like a middle molecule .
- Kinetics vary markedly between PD and HD
- For PD: PO4 removal correlates with Creatinine removal
- Residual renal function contributes in large part to phosphate excretion and subsequent phosphate balance

Po4 Removal Correlates With Creatinine Removal

Table 2a. Fluid and solute clearances, comparison across PD modality

Variable	Total	CAPD	CCPD	*P* Value
Dialysate volume (L/day)	11.4 ± 4.2	8.2 ± 1.6	14.4 ± 3.5	< 0.001
Ultrafiltration on PD (L/day)[a]	1.04 (0.67–1.43)	1.16 (0.63–1.45)	0.99 (0.67–1.36)	0.478
Peritoneal Kt/V	1.74 ± 0.4	1.62 ± 0.3	1.86 ± 0.4	< 0.001
Peritoneal creatinine clearance (L/wk/1.73 m^2 BSA)	45.6 ± 10.8	44 ± 8.1	47 ± 12.8	0.11
Peritoneal P/phosphate clearance (L/wk/1.73 m^2 BSA)	39.5 ± 11.3	40.9 ± 10.4	38.3 ± 12	0.199

[a]Median (interquartile range). *P* value by ANOVA if parametric variable, and by Kruskal-Wallis test if nonparametric. BSA, body surface area.

Badve et al, CJASN Vol3:1711-1717, 2008

Po_4 removal by dialysis(cont'd)

- Peritoneal PO4 removal/week is on the same magnitude of conventional 3/week HD.
- Peritoneal PO4 clearance is from both diffusive and convective properties.
- Membrane transport characteristics DO play role in phosphate clearance

Po4 Removal By PD

- ***Correlation with Modality and Membrane Transport Characteristics***

Variable	High	H Average	L Average	Low	*P*
Peritoneal Kt/V	1.87 ± 0.5	1.63 ± 0.5	1.58 ± 0.4	1.51 ± 0.4	0.016
Peritoneal Cr Cl (L/W/1.73m^2)	49.3 ± 12.2	41.8 ±13.9	37.1 ± 8.8	34.3 ± 12.2	0.005
Peritoneal PO_4 Cl (L/W/1.73m^2)	47.4 ± 12.6	39.4 ± 9.9	34.0 ± 7.6	31.4 ± 14.3	<0.0001

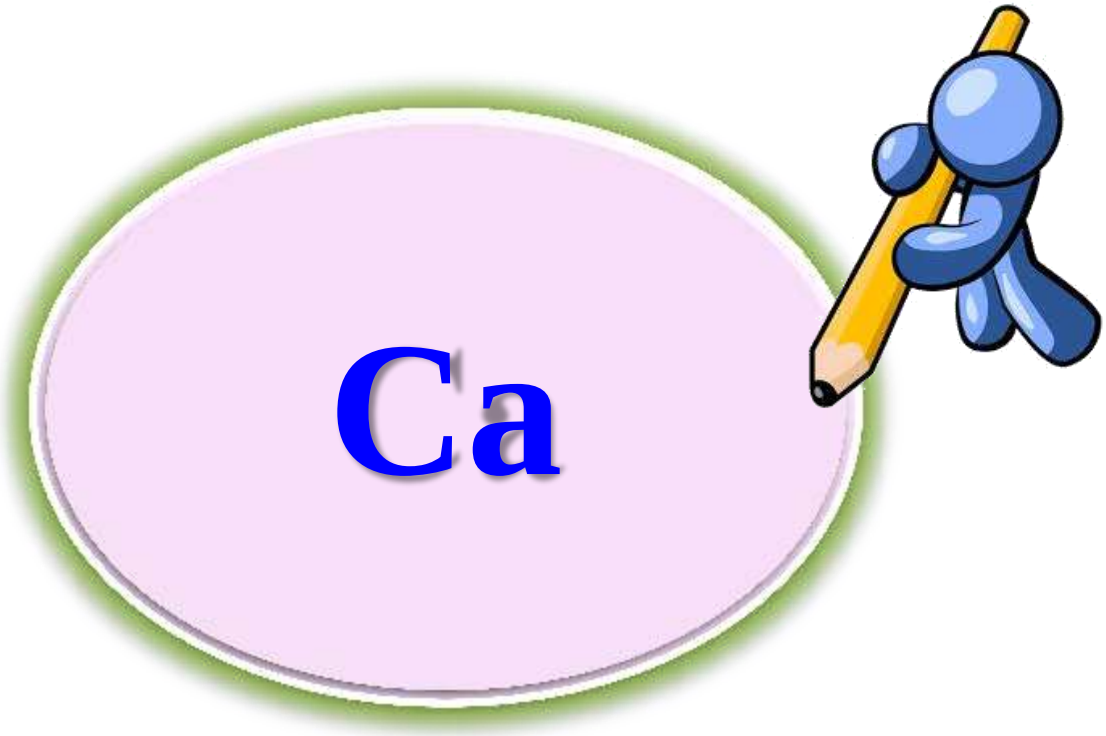
Bernardo et al. CJASN 6:591-597, 2011

CKD-MBD in PD

- **To achieve target serum phosphorus levels in PD patients**,
  - Dietary restriction of phosphorus in meals, preservation of residual kidney function for phosphorus excretion, and the use of an appropriate phosphorus binder and patient education.

Ther Apher Dial, Vol. 17, No. 3, 2013

MBD -CKD-in PD



CKD-MBD IN PERITONEAL DIALYSIS PATIENTS

- PD dialysates are divided into two types from the view point of the trans peritoneal calcium balance. One is standard-calcium dialysates (3.5 mEq/L), which trans peritoneally load calcium into the body, and the other type is low-calcium dialysates (2.5 mEq/L), which eliminate calcium from the body.

Ther Apher Dial, Vol. 17, No. 3, 2013

CKD-MBD IN PERITONEAL DIALYSIS PATIENTS

- Caution is necessary not to decrease serum calcium levels during the introduction period. Particularly, the use of low-calcium dialysates in patients with sustained residual kidney function may further reduce serum calcium levels and exacerbate secondary hyperparathyroidism;
- Therefore, the use of standard-calcium dialysates should be considered.
- In general, the use of 4.0 mEq/L calcium dialysates is not recommended.

Ther Apher Dial, Vol. 17, No. 3, 2013

CKD-MBD IN PERITONEAL DIALYSIS PATIENTS

Use of a low-calcium (2.5 mEq/L) dialysate reduces the occurrence of hypercalcemia and corrects low-turnover of bone.

Ther Apher Dial, Vol. 17, No. 3, 2013

CKD-MBD in PD

Prevalence of vitamin D deficiency in peritoneal dialysis patients.

Alwakeel JS[1], Usama S, Mitwalli AH, Alsuwaida A, Alghonaim M.

This cross-sectional study was conducted to investigate the prevalence of vitamin D deficiency among adult Saudi patients on regular PD The data was collected in the summer of 2010 from patients who were on PD for more than six months at the King Khalid University Hospital, Riyadh.

Saudi J Kidney Dis Transpl. 2014 Sep;25(5):981-5.

Prevalence of vitamin D deficiency in peritoneal dialysis patients.

Alwakeel JS[1], Usama S, Mitwalli AH, Alsuwaida A, Alghonaim M.

. There were 27 patients (11 males and 16 females) with a mean age of 46 (15-78 ± 21) years.

Five patients were on continuous ambulatory PD and 22 patients were using automated PD.

The average time on PD was 27.5 (6-84 ± 18.5) months.

Saudi J Kidney Dis Transpl. 2014 Sep;25(5):981-5.

Prevalence of vitamin D deficiency in peritoneal dialysis patients.

Alwakeel JS[1], Usama S, Mitwalli AH, Alsuwaida A, Alghonaim M.

Conclusion

Majority of the PD patients in our center had vitamin D deficiency. The possible reasons include chronic renal failure, dietary restrictions, loss of vitamin D and decreased exposure to sunlight.

Saudi J Kidney Dis Transpl. 2014 Sep;25(5):981-5.

Minerals, vitamin D, and parathyroid hormone in continuous ambulatory peritoneal dialysis.

Delmez JA, Slatopolsky E, Martin KJ, Gearing BN, Harter HR.

It was concluded that:

(1) Unlike chronic hemodialysis, continuous ambulatory peritoneal dialysis removes significant amounts of parathyroid hormone.

(2) Normal 25-(OH) vitamin D and vitamin D binding protein levels are maintained with continuous ambulatory peritoneal dialysis despite large protein losses.

(3) Substantial amounts of phosphorus are removed with continuous ambulatory peritoneal dialysis but not to an extent that precludes use of phosphorus binders.

Kidney Int. 1982 Jun;21(6):862-7.

Chronic Kidney Disease — Mineral Bone Disorder and Peritoneal Dialysis
Peritoneal Dialysis International, Vol. 28 (2008), Supplement 2
Printed in Canada.

0896-8608/08 $3.00 + .00

VITAMIN D AND PERITONEAL DIALYSIS

Mindy Banks and Stuart M. Sprague

Division of Nephrology and Hypertension, Evanston Northwestern Healthcare and Northwestern University, Feinberg School of Medicine, Evanston, Illinois

SUMMARY

RECOMMENDATIONS FOR VITAMIN D SUPPLEMENTATION:

• Unfortunately, almost no studies evaluating the benefit of correcting vitamin D (25-OH-D) deficiency in CKD are available. However, given the potential benefits of 25-OH-D repletion and the rampant 25-OH-D deficiency in PD populations,

our opinion is that screening for, and treatment of, deficiency should extend beyond early CKD.

Chronic Kidney Disease – Mineral Bone Disorder and Peritoneal Dialysis
Peritoneal Dialysis International, Vol. 28 (2008), Supplement 2
Printed in Canada.

0896-8608/08 $3.00 + .00

VITAMIN D AND PERITONEAL DIALYSIS

Mindy Banks and Stuart M. Sprague

Recommendations for vitamin D supplementation

- Screening should occur twice annually to account for seasonal variation in sun exposure.
- Until further information is available, repletion with ergocalciferol for the PD patient should resemble the recommendations of K/DOQI for patients with CKD stages 3 and 4. Patients could be started on ergocalciferol at 50000 U weekly for 4 – 8 weeks, and then maintained on 50000 U 1 – 2 times monthly, aiming for a target serum 25-OH-D between 30 ng/mL and 80 ng/mL.
- Our opinion is that this supplementation should be administered independently of VDRA use for controlling hyperparathyroidism.

MBD CKD-MBD in PD

Inverse correlation between serum magnesium and parathyroid hormone in peritoneal dialysis patients: a contributing factor to adynamic bone disease?

CONCLUSION:

- Serum Mg is lower and serum PTH higher in patients dialyzed with lower Mg concentration dialysis solution compared to those with higher Mg concentration dialysis solution.
- Our study confirms previous reports that serum Mg may have a suppressive role on PTH synthesis , and thus may play a role in pathogenesis of adynamic bone disease that often develops in patients on chronic PD with high calcium and high magnesium concentrations

June 2006, Volume 38, Issue 2, pp 317-322

Peritoneal Dialysis International, Vol. 26, pp. 366–373
Printed in Canada.

0896-8608/06 $3.00 + .00

RELATIONSHIP BETWEEN SERUM MAGNESIUM, PARATHYROID HORMONE, AND VASCULAR CALCIFICATION IN PATIENTS ON DIALYSIS: A LITERATURE REVIEW

Mingxin Wei,[1,2] Khaled Esbaei,[1,3] Joanne Bargman,[1] and Dimitrios G. Oreopoulos[1]

Home Peritoneal Dialysis Unit,[1] University Health Network and University of Toronto, Toronto, Ontario, Canada; Department of Nephrology,[2] Guangxi People's Hospital, Guangxi, P. R. China; Al-Fatah University,[3] Tripoli Central Hospital, Tripoli, Libya

CONCLUSION

There seems to be an inverse relationship between serum Mg and serum iPTH, and between serum Mg and vascular calcification, in dialysis patients.

We propose that MgCO3 may be a more effective, less toxic, and less expensive phosphate binder and hence an alternative to CaCO3. The protective effect of elevated serum Mg on secondary hyperparathyroidism and vascular calcification should be investigated further in prospective studies.

MBD-CKD in PD

Fibroblast Growth Factor 23 in Patients Undergoing Peritoneal Dialysis

Tamara Isakova, Huiliang Xie,* Allison Barchi-Chung,* Gabriela Vargas,* Nicole Sowden,* Jessica Houston,* Patricia Wahl,* Andrew Lundquist,† Michael Epstein,† Kelsey Smith,* Gabriel Contreras,* Luis Ortega,* Oliver Lenz, Patricia Briones,* Phyllis Egbert,‡ T. Alp Ikizler,‡ Harald Jueppner,§ and Myles Wolf**

Conclusions

Increased serum phosphate, loss of residual renal function, and lower renal phosphate clearance are associated with elevated FGF23 levels in ESRD patients undergoing peritoneal dialysis. FGF23 may be a more stable marker of phosphate metabolism in ESRD than PTH or serum phosphate.

Clin J Am Soc Nephrol 6: 2688–2695, November, 2011

Clinical Kidney Journal Advance Access published August 8, 2014

Clin Kidney J (2014) 0: 1–7
doi: 10.1093/ckj/sfu074

Original Article

CKJ

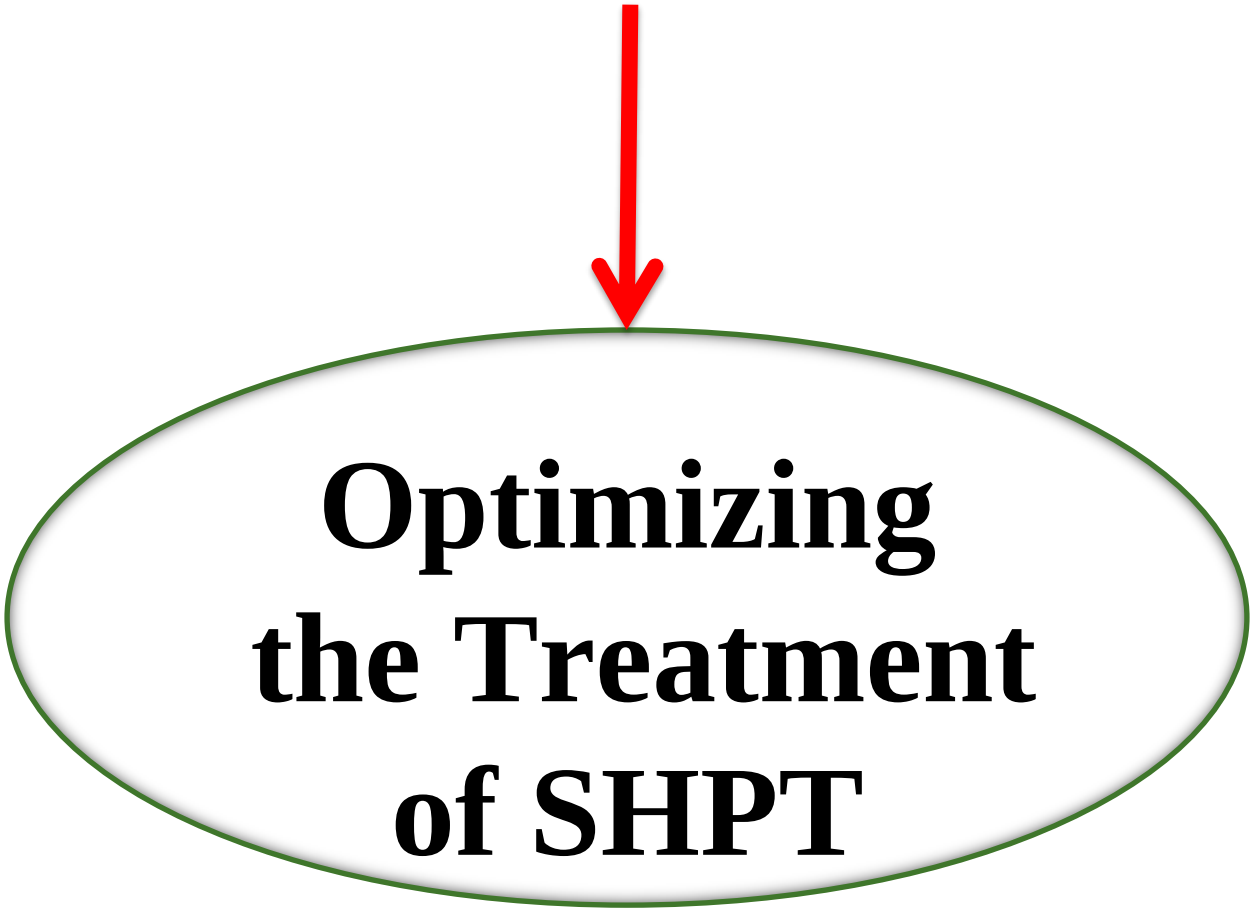
Longitudinal FGF23 and Klotho axis characterization in children treated with chronic peritoneal dialysis

Francisco J. Cano[1], Michael Freundlich[2], Maria L. Ceballos[1], Angelica P. Rojo[1], Marta A. Azocar[1], Iris O. Delgado[3], Maria J. Ibacache[1], Maria A. Delucchi[1], Ana M. Lillo[1], Carlos E. Irarrázabal[4] and Maria F. Ugarte[4]

Conclusions.

In this longitudinal study, FGF23 levels are markedly increased, and Klotho levels are reduced in PD children compared with controls. FGF23 levels appeared to be regulated primarily by serum calcium, showing a significant correlation at each time of measurement. This relationship was lost in patients with phosphorus >6 mg/dL. These observations may have important consequences to the therapeutic management of phosphate homeostasis in CKD patients.

CKD-MBD and PERITONEAL DIALYSIS

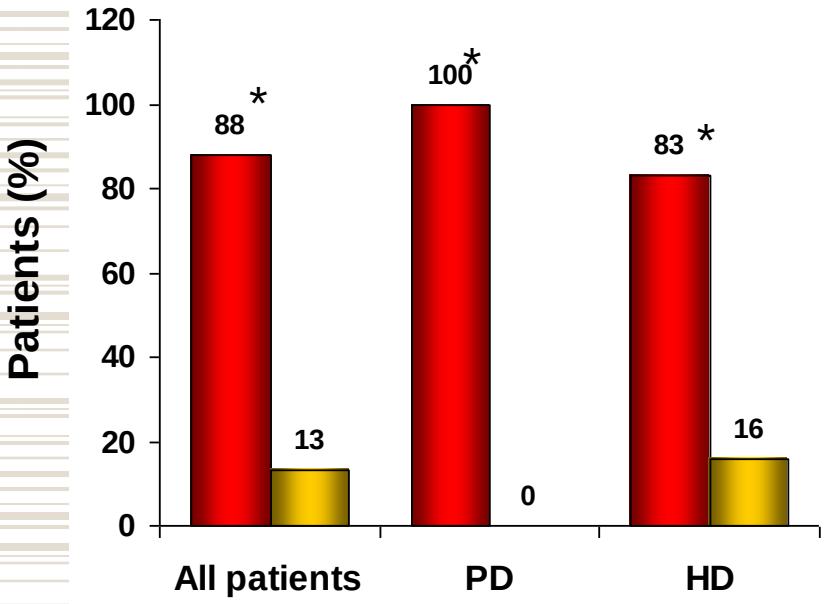


Effects of oral paricalcitol in reducing PTH
Study design

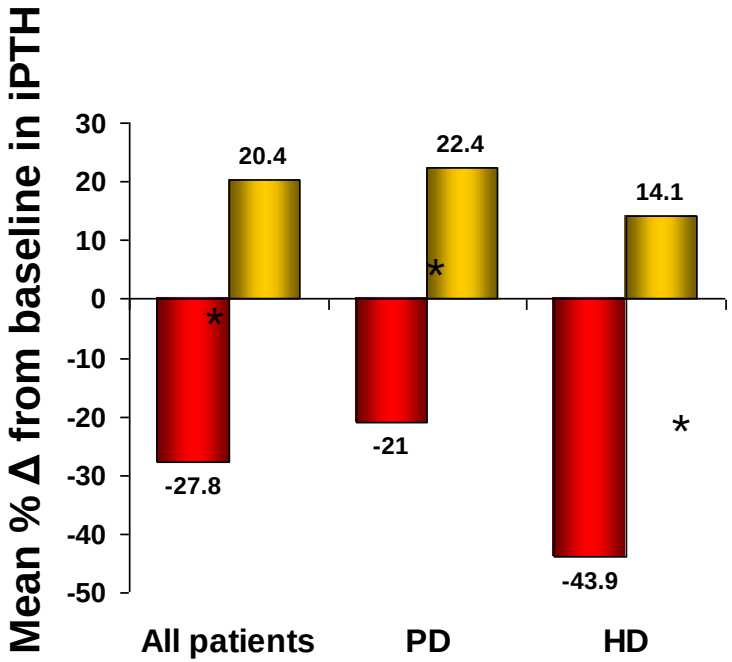
- 88 CKD Stage 5 pts with SHPT (iPTH ≥300 pg/mL; sCa 8.0–10.5 mg/dL; Ca x P ≤5 mg^2/dL^2) receiving chronic HD (n=62) or PD (n=26) randomised to oral paricalcitol or placebo for 12 weeks
- **Primary endpoints:**
  - Efficacy: 2 consecutive iPTH decreases ≥30% from baseline
  - Safety: Development of hypercalcemia (2 consecutive Ca measurements >11.0 mg/dL)
- **Secondary endpoints**:
  - Absolute and percentage changes in iPTH and markers of biochemical bone activity (BSAP, osteocalcin, collagen C-telopeptides (CTx), tartrate resistant acid phosphatase isoform 5b (TRAP-5b)

Decreases in iPTH with paricalcitol

Primary endpoint: % patients with 2 consecutive ≥30% decreases in iPTH from baseline



Change from baseline to last on-treatment visit



*p<0.001

Paricalcitol

Placebo

Cinacalcet HCl, an Oral Calcimimetic Agent for the Treatment of Secondary Hyperparathyroidism in Hemodialysis and Peritoneal Dialysis: A Randomized, Double-Blind, Multicenter Study

Jill S. Lindberg,* Bruce Culleton,† Gordon Wong,‡ Michael F. Borah,§ Roderick V. C
Warren B. Shapiro,¶ Simon D. Roger,** Fred E. Husserl,* Preston S. Klassen,††
Matthew D. Guo,†† Moetaz B. Albizem,†† and Jack W. Coburn‡‡a

J Am Soc Nephrol 16: 800–807, 2005. doi: 10.1681/ASN.2004060512

In summary, these findings demonstrate that cinacalcet is a safe and effective treatment for secondary HPT in PD and HD patients. Once-daily oral treatment with cinacalcet at doses up to 180 mg effectively reduced iPTH levels, regardless of dialysis modality or disease severity.

Sevelamer Carbonate: Significance of Improving Buffering Capacity

- Low bicarbonate levels are common in CKD patients, regardless of phosphate binder choice
- Removal of hydrochloride from Sevelamer HCl and the addition of carbonate from Sevelamer Carbonate to the GI tract may facilitate maintaining bicarbonate levels within recommended guidelines ranges

KDOQI Clinical Practice Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease. Available at http://www.kidney.org/professionals/KDOQI/guidelines_bone/Guide15.htm

Duggal A, Hanus M, Zhorov E, et al. *J Ren Nutr* 2006;16(3):248-252

Peritoneal dialysis patients using sevelamer do not present the acidosis problems that hemodialysis patients do.

Home Dialysis Unit, Ottawa Hospital, Ottawa, Ontario, Canada.

Patients on PD who take sevelamer maintain a serum bicarbonate level in the normal range as compared with hemodialysis patients, who frequently become acidotic.

Serum bicarbonate is only slightly lower in PD patients taking sevelamer than in those not taking that drug.

Advances in peritoneal dialysis. Conference on Peritoneal Dialysis 2005; 21:185-7.

CKD-MBD IN PERITONEAL DIALYSIS PATIENTS

- Sevelamer hydrochloride, lanthanum carbonate, and cinacalcet have been confirmed to be just as effective in PD patients as in HD patients.

Ther Apher Dial, Vol. 17, No. 3, 2013

Operative Strategies

- **Subtotal parathyroidcomy (SPTX)**
  - Resection of 3 ½ parathyroid gland
  - The most healthy looking parathyroid gland chosen
  - Leaving a portion of viable parathyroid gland and marked with clip
- **Total parathyroidcomy with autotransplantion(TPTX+AT)**
  - The most healthy looking parathyroid gland chosen
  - Implantation of a portion of parathyroid gland
- **Total parathyroidcomy without autotransplantion (TPTX)**

Peritoneal Dialysis International, Vol. 20, pp. 200–208
Printed in Canada.

0896-8608/00 $3.00 + .00

RECURRENCE OF HYPERPARATHYROIDISM AFTER TOTAL PARATHYROIDECTOMY AND AUTOTRANSPLANTATION IN PERITONEAL DIALYSIS PATIENTS

Aimin Zhong, Viswanath Billa, Lorne E. Rotstein,[1] Pui Y. Wong,[2] Joanne M. Bargman, Stephen I. Vas, and Dimitrios G. Oreopoulos

Division of Nephrology, Division of Surgery of the Head and Neck,[1] and Laboratory Medicine & Pathobiology,[2] The Toronto Hospital and University of Toronto, Toronto, Ontario, Canada

In **summary**,

total PTX with auto-transplantation in the short term effectively and safely relieves the symptoms of secondary HPT and decreases patients' PTH levels. However, this procedure is associated with a tendency to high recurrence of HPT.

Peritoneal Dialysis International, Vol. 20, pp. 200–209
Printed in Canada.

0896-8608/00 $3.00 + .00

RECURRENCE OF HYPERPARATHYROIDISM AFTER TOTAL PARATHYROIDECTOMY AND AUTOTRANSPLANTATION IN PERITONEAL DIALYSIS PATIENTS

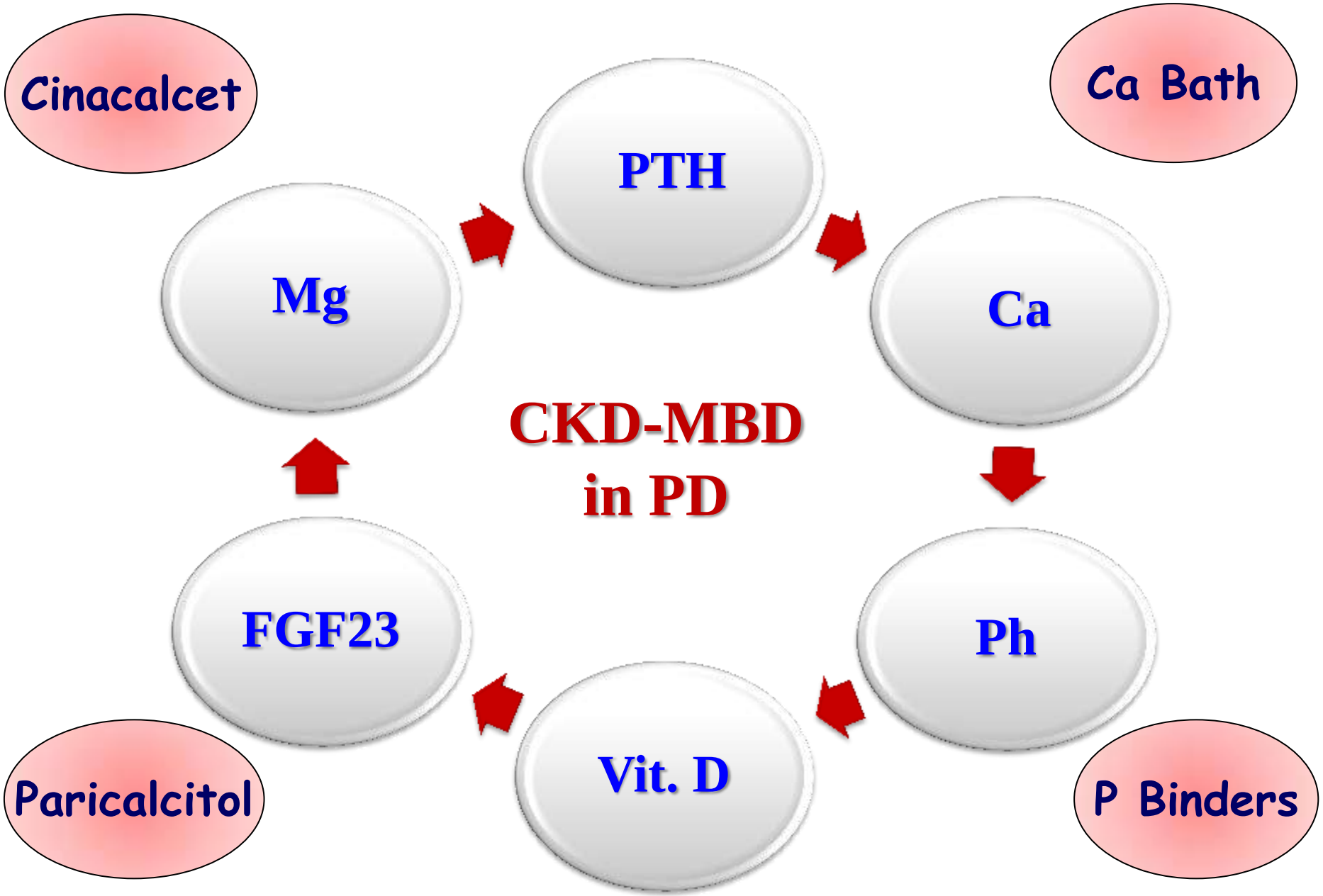
Aimin Zhong, Viswanath Billa, Lorne E. Rotstein,[1] Pui Y. Wong,[2] Joanne M. Bargman, Stephen I. Vas, and Dimitrios G. Oreopoulos

Division of Nephrology, Division of Surgery of the Head and Neck,[1] and Laboratory Medicine & Pathobiology,[2] The Toronto Hospital and University of Toronto, Toronto, Ontario, Canada

The present results lead us to suggest that total PTX with auto-transplantation may not be an effective procedure for controlling HPT over the long term and that total PTX without auto-transplantation may be the treatment of choice.

A controlled study evaluating the recurrence of hyperparathyroidism after total PTX with or without Auto-transplantation is needed for a definite conclusion.

SUMMARY


Cinacalcet
Ca Bath
PTH
Mg
Ca
CKD-MBD
in PD
FGF23
Ph
Vit. D
Paricalcitol
P Binders

World Kidney Day

رابطة أطباء الكلى بالدقهلية

اليوم العالمى للكلى

بجامعة الدلتا للعلوم والتكنولوجيا بجمصة الإثنين ٢٠١٦/٣/٧

ISN International Federation of Kidney Foundations

رابطة أطباء الكلى بالدقهلية

اليوم العالمى للكلى

بجامعة الدلتا للعلوم والتكنولوجيا بجمصة الإثنين ٢٠١٦/٣/٧

رابطة أطباء الكلى بالدقهلية

اليوم العالمى للكلى

بجامعة الدلتا للعلوم والتكنولوجيا بجمصة الإثنين ٢٠١٦/٣/٧


ISN
ESOT
DNG
NMGH
Parathyroid glands
4th Para Thyroidectomy (Hands On) Master Class
(Advansed Course)
الدورة التدريبية الرابعة لاستئصال الغدة الجار درقية لمرضى القصور الكلوى المزمن
بالتعاون بين قسم الكلى بمستشفى المنصورة الدولى ومستشفى الساحل التعليمى
El-Sahel Teaching Hospital - Cairo - Egypt
22 - 28 October 2016
المدير الجراحى للدورة
ا.د / أحمد حلاوة
المدير الطبى للدورة
د / اسامه الشحات


INNOVATION
SUCCESS
EVALUATION
DEVELOPMENT
GROWTH
SOLUTION
PROGRESS
MARKETING
TEAMWORK

Thank YOU